UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/469,619	12/22/1999	NOBUYUKI AIHARA	500.38034X00	5168

20457 7590 03/13/2002

ANTONELLI TERRY STOUT AND KRAUS
SUITE 1800
1300 NORTH SEVENTEENTH STREET
ARLINGTON, VA 22209

EXAMINER	
LAXTON, GARY L	
ART UNIT	**PAPER NUMBER**
2838	

DATE MAILED: 03/13/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	**Application No.** 09/469,619	**Applicant(s)** AIHARA ET AL.	
	Examiner Gary L. Laxton	**Art Unit** 2838	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _28 January 2002_ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-22_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-22_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 1/26/02 have been fully considered but they are not persuasive.

Per applicant's request for references in support of Examiners allegations of obviousness to one of ordinary skill in the art of applicant's claim limitations per MPEP §2144.03; Examiner has obliged applicant and provided obvious support for Examiner's official position. In particular, Examiner has provided support for nullifying applicant's contention that 'controlling the output voltage of DC power of an AC/DC converter to be equal to a predetermined voltage', in not well known in the art. And furthermore, with little effort, the Examiner has provided further support for nullifying applicant's contention that 'controlling the on/off actuation of a semiconductor switching device of an AC/DC converter to control the suppression of harmonic current in AC input power' is not well known in the art and would not have been obvious to utilize in an AC/DC converter circuit.

The Examiner once again states that controlling the output voltage of an AC/DC converter has been known for years. Also known for years, and a highly desirable feature for an AC/DC converter, is the operation of controlling the harmonic currents from AC input supplies in order to suppress unwanted harmonics; also known as power factor control which apparently the applicant is unaware of. The Examiner, therefore, proves conclusively that these facts asserted by the Examiner in the prior office actions and disputed by the applicant are very well known in the art as well as extremely desirable; and has therefore provided evidence in favor of the

Examiner's assertions for the applicant convenience to educate themselves with since the applicant is apparently unaware that it is well known in the art to regulate the output of an AC/DC converter or to suppress harmonics in an AC/DC converter as evident from the remarks contained in the arguments filed 1/26/02.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-14, 19, 21 and 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1:

- Claim 1 recites '"a DC/DC converter which receives said DC power from said AC/DC converter and controls a level of an output voltage of said DC/DC converter to be equal to a level of a voltage to be used by a load ***while said DC/DC converter supplies said output voltage of said DC/DC converter having a level thereof controlled to said load***"; lines 9-11 (highlighted) are unclear in meaning (vague and confusing) rendering the claim indefinite.

Claims 2-14, 19, 21 and 22 inherit the same deficiency due to dependency.

- Claim 1 also recites "having a level thereof" in line 10. Having "a level" is vague and indefinite. Unclear what "level" is being referenced.

Claims 21 and 22:

Claims 21 and 22 recite the limitation selecting "in accordance with the load capacity and purpose of use", these limitations fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Load capacity and purpose of use are particularly not clearly pointed out and distinctly claimed.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-3, 5 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Levran et al.

Levran et al disclose a power conversion and distribution system comprising a power supply comprising an AC/DC converter which receives AC power, of course, converts the AC power into DC power, of course, and in fact also outputs DC power, of course, the AC/DC converter includes a control circuit which controls an output voltage of the DC power output wherein the control circuit controls the input voltage to be equal to a predetermined DC voltage. (E.g. "There are several embodiments of AC to DC converter 512, shown or represented in FIGS. 3 to 7, and several preferred embodiments of a DC to DC converter 580, are shown or represented in FIGS. 8 to 15, as described more fully herein. The present invention is usable for any number of different phases of incoming AC power and the power converters may be operated in a fixed

frequency mode or hysteresis mode. Feedback is preferred for most applications envisioned, and there are several types of feedback which may be employed including pure demand based on the DC output voltage, and demand as modified to accommodate the instantaneous phase of the incoming AC power. In fixed frequency mode for the AC to DC converter 512, the switching elements in one preferred embodiment are switched on and off at a rate of approximately 8 kHz during the appropriate portion of the incoming AC waveform in order to distribute the load evenly among all AC power phases. Because the AC to DC converter 512 can operate at different frequencies, another preferred embodiment of the invention has the converter 512 operating at higher frequencies, such as about 18 kHz, which permits use of smaller components and higher conversion efficiencies. A line filter may be located between the incoming AC waveform and the switching elements to buffer the load from the incoming AC power and to provide adjustment of circuit values to accommodate different voltages, such as by providing multiple taps on inductors in the line filter. The embodiment of the converter 512 shown in FIG. 3 may operate in a fixed frequency mode circuit. A three-phase input is shown labeled V1, V2 and V3 connected to a line filter 22 consisting of a series resistance and inductance network in association with a parallel capacitance network employed in association with each of the incoming phases of the power source, V1, V2, and V3."). Additionally, for further support, the additional secondary windings 576 connect the intermediate AC signal to other submodules such as AC to DC converter 538 ***which may provide a predetermined DC voltage level*** across lines 540 and 542, or, like submodule 532, may be programmable, providing a variable voltage level across lines 540 and 542. The additional secondary windings 576 may couple respective AC to DC or AC to AC converters, as desired. One aspect of the prior art invention employs a high

voltage switching network to generate a direct current (DC) distribution voltage from a one or more phase alternating current (AC) supply. This circuitry is preferably solid state, and does not employ a transformer. In one embodiment, the system provides a feedback loop which monitors the DC distribution voltage and selectively enables switching elements to select a desired input phase in order to maintain the DC distribution voltage. The feedback network executes arithmetic functions in order to select a switching time that substantially eliminates a current component which is perpendicular to the voltage vector at the switching time.

However, Levran do not disclose a DC/DC converter per se accepting power from the AC/DC converter.

Levran do teach a DC to DC conversion process (580) wherein circuit (580) accepts DC input (520) and produces DC output. Therefore, in this sense Levran do disclose a DC/DC converter when viewed as a whole. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize a DC/DC converter to accept DC power from the AC/DC converter and output a DC power for use by the load.

Furthermore, Levran disclose a DC converter circuit (526) disclosed as a DC chopper circuit. Still further disclosed is a DC power storage means which supplies electric power to the DC/DC converter. The DC converter being bi-directional. (i.e. "The DC voltage level across lines 520 and 522 also can be connected to a chopper circuit 526 and battery backup 528. The chopper circuit 526 provides charging of the battery backup 528 while AC power is being provided to the AC to DC converter 512. If the AC power fails, the chopper circuit reverses, and drives the DC lines 520 and 522 with power supplied by the battery backup 528. In some configurations, it may be desirable to activate chopper circuit 526 to provide power from battery backup 528 in the

event that the incoming AC power is reduced or lost, to provide sufficient power to operate the load. This is preferably only be done on a temporary basis as the battery backup could be severely depleted or lost while supplementing power which would normally be supplied by the incoming AC power.")

Claims 2, 3 and 5:

Levran et al disclose a chopper circuit, however, it would not have been beyond the skill of one ordinarily skilled in the art to provide a booster circuit in place of the chopper for boosting the voltage instead of chopping it.

Claim 19:

In one form of the invention, an AC to DC converter accepts the input waveform and converts it to a direct current waveform prior to applying the waveform to the direct current to alternating current converter. The AC to DC converter preferably operates at a very high frequency and, in the preferred embodiment, includes an inductance input filter network having adjustable components for operating at various frequencies and at various voltages, a switching network efficiently converting the incoming AC signal to an output DC signal, and preferably includes control circuits for the switching network having feedback for optimizing the operation of the switching network. According to one aspect of the present invention, the AC to DC converter has a very small size, is very efficient, has an essentially unity power factor, and is transparent to frequency and voltage variations. Also preferably, the AC to DC converter can operate in a hysteresis modulation mode and preferably operates to minimize the difference between the real power and the apparent power in the circuit.

In accordance with the teachings of the present invention, the DC signal present across lines 520 and 522 is converted into other waveforms, and including other DC levels or to an AC voltage by first converting the DC signal to an intermediate AC signal. Preferably, the intermediate AC signal is at a sufficiently high frequency above that of the input waveform to improve the efficiency and ***power factor***. The intermediate AC signal is then converted into one or more output DC signals, or one or more output AC signals as required. In addition, the intermediate AC signal can be used to drive a ***bi-directional*** converter to supply battery backup for the power conversion system, as discussed more fully below.

6. Claim 14-18, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Levran et al in combination with Kageyama.

Levran et al disclose a power conversion and distribution system comprising a power supply comprising an AC/DC converter which receives AC power, of course, converts the AC power into DC power, of course, and in fact also outputs DC power, of course, the AC/DC converter includes a control circuit which controls an output voltage of the DC power output wherein the control circuit controls the input voltage to be equal to a predetermined DC voltage. (E.g. "There are several embodiments of AC to DC converter 512, shown or represented in FIGS. 3 to 7, and several preferred embodiments of a DC to DC converter 580, are shown or represented in FIGS. 8 to 15, as described more fully herein. The present invention is usable for any number of different phases of incoming AC power and the power converters may be operated in a fixed frequency mode or hysteresis mode. Feedback is preferred for most applications envisioned, and

there are several types of feedback which may be employed including pure demand based on the DC output voltage, and demand as modified to accommodate the instantaneous phase of the incoming AC power. In fixed frequency mode for the AC to DC converter 512, the switching elements in one preferred embodiment are switched on and off at a rate of approximately 8 kHz during the appropriate portion of the incoming AC waveform in order to distribute the load evenly among all AC power phases. Because the AC to DC converter 512 can operate at different frequencies, another preferred embodiment of the invention has the converter 512 operating at higher frequencies, such as about 18 kHz, which permits use of smaller components and higher conversion efficiencies. A line filter may be located between the incoming AC waveform and the switching elements to buffer the load from the incoming AC power and to provide adjustment of circuit values to accommodate different voltages, such as by providing multiple taps on inductors in the line filter. The embodiment of the converter 512 shown in FIG. 3 may operate in a fixed frequency mode circuit. A three-phase input is shown labeled V1, V2 and V3 connected to a line filter 22 consisting of a series resistance and inductance network in association with a parallel capacitance network employed in association with each of the incoming phases of the power source, V1, V2, and V3."). Additionally, for further support, the additional secondary windings 576 connect the intermediate AC signal to other submodules such as AC to DC converter 538 ***which may provide a predetermined DC voltage level*** across lines 540 and 542, or, like submodule 532, may be programmable, providing a variable voltage level across lines 540 and 542. The additional secondary windings 576 may couple respective AC to DC or AC to AC converters, as desired. One aspect of the prior art invention employs a high voltage switching network to generate a direct current (DC) distribution voltage from a one or

more phase alternating current (AC) supply. This circuitry is preferably solid state, and does not employ a transformer. In one embodiment, the system provides a feedback loop which monitors the DC distribution voltage and selectively enables switching elements to select a desired input phase in order to maintain the DC distribution voltage. The feedback network executes arithmetic functions in order to select a switching time that substantially eliminates a current component which is perpendicular to the voltage vector at the switching time.

However, Levran do not disclose a DC/DC converter per se accepting power from the AC/DC converter.

Levran do teach a DC to DC conversion process (580) wherein circuit (580) accepts DC input (520) and produces DC output. Therefore, in this sense Levran do disclose a DC/DC converter when viewed as a whole. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize a DC/DC converter to accept DC power from the AC/DC converter and output a DC power for use by the load.

Furthermore, Levran disclose a DC converter circuit (526) disclosed as a DC chopper circuit. Still further disclosed is a DC power storage means which supplies electric power to the DC/DC converter. The DC converter being bi-directional. (i.e. "The DC voltage level across lines 520 and 522 also can be connected to a chopper circuit 526 and battery backup 528. The chopper circuit 526 provides charging of the battery backup 528 while AC power is being provided to the AC to DC converter 512. If the AC power fails, the chopper circuit reverses, and drives the DC lines 520 and 522 with power supplied by the battery backup 528. In some configurations, it may be desirable to activate chopper circuit 526 to provide power from battery backup 528 in the event that the incoming AC power is reduced or lost, to provide sufficient power to operate the

load. This is preferably only be done on a temporary basis as the battery backup could be severely depleted or lost while supplementing power which would normally be supplied by the incoming AC power.")

Lastly, Levran et al do not teach parallel connecting or using more than one of the same type of converters.

Kageyama teaches just one example that it is well known in the art to parallel connect a plurality of converters including AC/DC converters or DC/DC converters in power backup systems to provide redundancy for single unit failures. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to parallel connect a plurality of converters in order to provide redundant power modules to provide constant power to a load in the case of a unit power failure, as taught by Kageyama.

7. Claims 1-13 and 19 rejected under 35 U.S.C. 103(a) as being unpatentable over Yeh in combination with Gephart and further in combination with Mao.

Figure 2 of Yeh discloses claims 1-3, 5 and 6. Claims 4-13 are disclosed in figures 1, 3-8 (Col. 1 lines 30-60; Col. 2 lines 50-65; Col. 3 lines 1-35; Col. 4 lines 40-65).

However, Yeh does not disclose an AC/DC controller.

Gephart et al illustrates that it has been known since at least 1986 that AC/DC do in fact have controllers to regulate the voltage level see figures 1, 3 and 4A; see also col. 10 lines 44 and 45 for explicit teaching of maintaining (e.g. regulating) a voltage by control. Therefore, it would have been most obvious to one having ordinary skill in the art at the time the invention was made

to utilize an AC/DC converter with a controller for controller the switching operation of the controller for regulating voltage levels.

Furthermore, power factor correcting is a highly desirable function for increasing circuit efficiency and is most always done by switching (e.g. actuating on/off at least one switch). Mao, for one example (see also Levran et al for more power factor control teaching) teaches power factor correction for and AC to DC converter. Therefore with evidence provided, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate power factor correction in order to improve circuit efficiency since it is well known that power factor control improves efficiency and improving efficiency is highly desirable for the obvious reasons of the benefits of increasing the efficiency of the circuit.

8. Claims 14, 16-18, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yeh in combination with Gephart and further in combination with Mao and still further in combination with Kageyama.

Yeh in combination with Gephart and further in combination with Mao disclose the claimed invention as stated above with reference to claim 1 except for parallel connecting a plurality of converters or using more than one of the same converter.

Kageyama teaches just one example that it is well known in the art to parallel connect a plurality of converters including AC/DC converters or DC/DC converters in power backup systems to provide redundancy for single unit failures. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to parallel connect a plurality of

converters in order to provide redundant power modules to provide constant power to a load in the case of a unit power failure, as taught by Kageyama.

9. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yeh in combination with Gephart and further in combination with Mao and still further in combination with Kageyama.

Yeh discloses the claimed invention except for showing that the AC/DC is controlled to maintain a regulated voltage at the output of the AC/DC controller.

Gephart et al illustrates that it has been known since at least 1986 that AC/DC do in fact have controllers to regulate the voltage level see figures 1, 3 and 4A; see also col. 10 lines 44 and 45 for explicit teaching of maintaining (e.g. regulating) a voltage by control. Therefore, it would have been most obvious to one having ordinary skill in the art at the time the invention was made to utilize an AC/DC converter with a controller for controller the switching operation of the controller for regulating voltage levels.

Furthermore, power factor correcting is a highly desirable function for increasing circuit efficiency and is most always done by switching (e.g. actuating on/off at least one switch). Mao, for one example (see also Levran et al for more power factor control teaching) teaches power factor correction for and AC to DC converter. Therefore with evidence provided, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate power factor correction in order to improve circuit efficiency since it is well known that power factor control improves efficiency and improving efficiency is highly desirable for the obvious reasons of the benefits of increasing the efficiency of the circuit.

However, Yeh in combination with Gephart and Mao still fail to disclose a plurality of converters in parallel.

Kageyama teaches just one example that it is well known in the art to parallel connect a plurality of converters including AC/DC converters or DC/DC converters in power backup systems to provide redundancy for single unit failures. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to parallel connect a plurality of converters in order to provide redundant power modules to provide constant power to a load in the case of a unit power failure, as taught by Kageyama.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gary L. Laxton whose telephone number is (703) 305-7039. The examiner can normally be reached on 5-4-9.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Nappi can be reached on (703) 308-3370. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-7724 for regular communications and (703) 305-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Edward H. Tso
Primary Examiner

GLL
March 9, 2002